the museum of the Institute of Jamaica, and later were briefly described by Messrs. Grabham and Cockerell in NATURE (1892, p. 514), when the specific term *Jamaicensis* was suggested. The year following over a dozen specimens were received by Dr. Grabham, also from Bath. The locality is in a most humid part of the eastern extremity of the island. Two or three examples have since been secured from widely separated spots, but the species has hitherto been regarded as one of much rarity, and as uncertain in its distribution. Various attempts made by different collectors to secure specimens have been unsuccessful.

Prof. E. L. Bouvier, who has lately been making a systematic study of the genus, recognises two species—*P. jamaicensis* and *P. juliformis* var. Gossei—among the Jamaica representatives, (cf. *Quart. Jour. Micr. Sci.*, vol. xliii. p. 750). Prof. Ray Lankester, on behalf of Prof. Bouvier, has recently communicated with the Institute of Jamaica asking for additional specimens. A general description of Peripatus was accordingly inserted in the local newspapers, and offers of reward were made with the object of encouraging the peasantry to search for the animal, but this was of no avail. A visit, since made by the writer, to Bath resulted in the securing of a number of examples. These were exhibited in the neighbourhood and a sum was offered for further specimens, with the result that before long numbers began to pour in and soon upwards of fifty were obtained. Dr. Grabham also secured a large supply. Afterwards more than eighty specimens were dispatched to the Museum, then another fifty were offered, and now that a local enthusiasm has been created it would seem that examples in plenty might be procured at any time. It is thus obvious that the animal is by no means so rare as has been supposed.

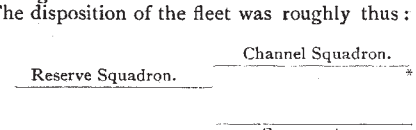
The creatures are found under stones and rotten wood, often buried for a short distance in the earth. Most are blackish brown or green, much lighter on the ventral surface; others are reddish black above and light flesh-coloured beneath; but many intermediate tints occur. A reddish-brown colour is extracted at first by alcohol, and the distinctive colours are soon lost. Specimens of all sizes were obtained, including individuals in which parturition took place during preservation. The length of the newly born was as much as 2 cm. J. E. DUERDEN.

Institute of Jamaica, Kingston, February 12.

Audibility of the Sound of Firing on February 1.

FROM the letters written to NATURE and to the *Standard* by correspondents who heard at very great distances the guns fired at Portsmouth on February 1, it seems to be the general impression that the firing was by volleys, if one may use a convenient but probably technically incorrect expression. This was not the case. It would be very desirable that the official order of firing should be published. If this is not done, there may be some interest in a note on the order as it appeared to me, watching from the sea-front near Southsea Castle.

The disposition of the fleet was roughly thus:



The first gun of each round of firing seemed to me to be fired far down the line, from the flagship of the Reserve Squadron; but of this I cannot be sure. It was immediately succeeded by the gun from the *Majestic*, flagship of the Channel Squadron; and from this the firing ran down the double line, the intervals between the successive pairs of flashes being about half a second. It was impossible to see from Southsea whether the Reserve Squadron followed the lead of the Channel Squadron or of its own flagship. In the latter case, after the leading guns from the flagships there would have been four guns, in the former case two guns every half second, for a space of some seconds.

These details are from memory, and may require some correction. The important fact is that the guns were fired in quick succession, and not simultaneously.

The line of ships was about eight miles long, roughly east and west, and Southsea was about a mile north of the eastern end. But the roll of the guns lasted only about twenty seconds—that is to say, scarcely any sound reached us from the western division of the line, which was hidden from sight by a projecting point of land. It is not surprising, therefore, that nothing was heard at Chichester and other places comparatively near Portsmouth. ARTHUR R. HINKS.

Cambridge, February 26.

Protective Markings in Animals.

I ENCLOSE a photograph of my cat asleep, in which may be plainly seen the resemblance to open eyes, borne by the markings above the orbits. In the living cat this resemblance is so striking that my attention was first drawn to it by my fancying that he was sleeping with his eyes open.

I have noticed the same markings in other cats, but never quite so distinct. The advantages, to a non-domesticated animal, of such an arrangement are obvious, and I think it may interest some of your readers. Besides these marks over the eyes, I observe in a good many cats that the fur on the lower jaw is generally light and bounded by markings following the line of the mouth, thus giving a heightened effect when open, whilst when shut, during sleep, the cat has, at a distance, the appearance of having the mouth still open. CLARENCE WATERER.

Highfield, Northdown Avenue, Margate, February 26.

Snow Crystals.

A FALL of snow stars, similar to that described by Mr. Wm. Gee (p. 420), occurred near Sutton Coldfield about 1876, as near as I can remember. I was much struck by their beauty and the graceful way they fell to the earth. C. J. WOODWARD.

Municipal Technical School, Birmingham, March 2.

THE NEW STAR IN PERSEUS.[1]

DR. COPELAND was kind enough to inform me by telegram, on the afternoon of February 22, of the discovery by Dr. Anderson of a new star in the Milky Way in Perseus on the early morning of that day. It was stated that its position was R.A. 3h. 24m. 25s. and Declination +43° 34′, its magnitude 2·7, and colour of a bluish-white. Later in the evening this information was corroborated by another telegram from the "Centralstelle" at Kiel.

Owing to cloudy weather, no photographs could be obtained at Kensington until the evening of the 25th. Momentary glimpses of the star on the evening of the 22nd, between the hours of 6 and 7.30 p.m., indicated that the Nova had considerably brightened since the time of its discovery, as it was estimated as a little brighter than a first magnitude star; no satisfactory observations of the spectrum could be made.

Another glimpse on the early morning (1.30 a.m.) of Monday (25th) showed that the star was still of about the first magnitude.

Prof. Pickering reports that the Nova was dimmer than an eleventh magnitude star on February 19. On the 23rd it was as bright as Capella.

The star, therefore, was then at least 10,000 times brighter than it was four days previously, and ranks as the brightest new star recorded since that which appeared in the year 1604.

Since the 25th the brightness has diminished slightly, and on the evening of the 27th was estimated between the first and second magnitude (1·7). If this reduction of brilliancy continues at the same rate, the new star will evidently be shorter lived than those to which it has most closely approximated in luminous intensity at the maximum, and less time will be available for studying the spectral changes which may be anticipated. I may state that Tycho's Nova (1572) was visible for nearly one and a half years, and Kepler's (1604) for about the same period.

It is interesting to note that the star was described by Dr. Anderson as being of a bluish-white colour at the

[1] Preliminary note. By Sir Norman Lockyer, K.C.B., F.R.S. Received and read before the Royal Society, February 28.

time of discovery. Since it has diminished in brightness this has changed, and on the night of February 27 a reddish tinge was observed.

Although the sky on Monday evening was by no means free from clouds, ten very satisfactory photographs were secured with the three instruments in regular use for stellar spectra. Edwards's isochromatic plates were used, as it was considered desirable to secure a record of the green part of the spectrum.

Although there has not been time for a complete discussion of these photographs, it may be stated that the spectrum contains numerous dark lines, several of which are associated with bright bands on the less refrangible side. Further, the spectrum, as a whole, greatly resembles that of Nova Aurigæ.

One of the chief features of the principal bright lines is their great width, amounting to 30 tenth-metres, and each is accompanied by a dark line of considerable breadth on its more refrangible side. A comparison spectrum of γ Orionis, photographed alongside that of the Nova on one of the plates, indicates that the middle portions of the bright lines are not far from their normal positions; those of the dark ones, however, are displaced by some 15 tenth-metres towards the violet, thus indicating a differential movement of something like 700 miles a second.

Movements more rapid and disturbances more violent than those observed in Nova Aurigæ are therefore indicated; both by the greater displacement of the dark lines relatively to those that are bright and the greater breadth of the bright and dark lines.

tested by inquiring whether other prominent enhanced lines of iron so strongly visible in the spectrum of α Cygni were present.

A comparison with the spectrum of this star photographed with the same instruments suggested that many lines between F and h in the Nova probably correspond with lines in α Cygni. Certainty could not be arrived at in consequence of the great breadth of the lines in the Nova.

Hence, as the Nova bore some resemblance to both Nova Aurigæ and α Cygni, a reference was suggested to the lines recorded in the spectrum of Nova Aurigæ which were observed when the light of that star was on the wane, and when the lines were thinned enough to be easily measurable. I may also add that these observations were made before the work on enhanced lines was undertaken.

The importance of this reference was strengthened by the consideration that with such a tremendous outburst we should expect the original invisible swarm to have been (very rapidly) advanced to a considerable condensation at the locus of impact, and therefore to resemble some "star" which had (slowly) arrived at a position pretty high up on the ascending temperature curve in the ordinary course of evolution on the meteoritic hypothesis.

A comparison of the bright lines recorded by Campbell and Vogel[2] in the spectrum of Nova Aurigæ with the strongest lines of α Cygni—a very detailed record of the spectrum of which star has been recently compiled here

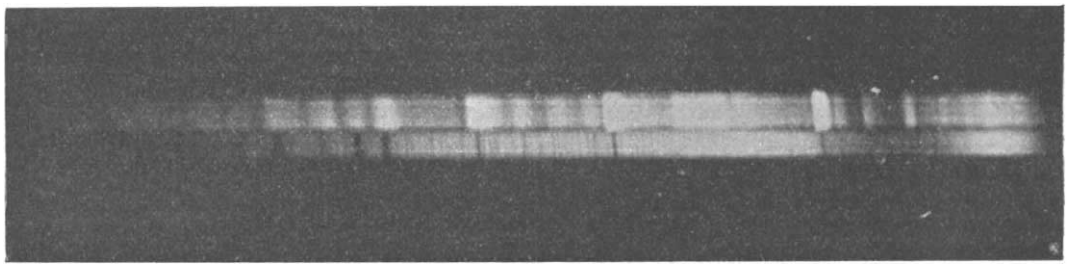


FIG. 1.—Spectrum of Nova and α Persei compared.

The comparison of spectra shows us that we are dealing with two swarms, one of which, the less dense, gives us broad bright lines and is almost at rest with reference to the line of sight; the denser swarm, indicated by the dark lines, is in most rapid movement in the line of sight towards the earth.

An interesting feature of the spectrum is the presence of fine dark lines down the middle of each of the bright lines of hydrogen and calcium; these are most probably reversals, and if this be so, they will be of great service for accurate determination of the wave-lengths of the other bright lines.

The dark hydrogen line Hγ, and perhaps Hβ and Hδ, are also possibly reversed.

Eye observations showed among the chief lines a group of four in the green; one probably Hβ, the others near $\lambda\lambda$ 492, 501 and 517; a bright line at or near D, and a brilliant red line probably corresponding to Hα. Each of these was accompanied by a dark broad line on its more refrangible side. Other lines of less brightness were observed both in the green and red.

It at first seemed probable that two of the bright lines in the green ($\lambda\lambda$ 492 and 501) might be due to asterium, while that in the orange was perhaps the helium line D_3. Subsequent investigation, however, suggested as an alternative origin that these lines might be the enhanced lines of iron at λ 4924·1 and 5018·6, which are very nearly in the same positions as the asterium lines. This view was

—shows that there is a close agreement between the two sets of lines. These strong α Cygni lines are almost without exception the representatives of "enhanced" lines of some of the metals, chiefly Fe, Ti, Cr, Ni, Ca, Sr, and Sc. If we exclude the lines of hydrogen from those which were recorded in the spectrum of Nova Aurigæ, there remain forty-four lines for comparison. Thirty of these, or about 70 per cent., agree approximately in position with either strong isolated lines or groups of lines in the spectrum of α Cygni.

It may be assumed that, taking into consideration the broad nature of the Nova lines, if there be any genuine connection between them and the lines of α Cygni, any close groups of separately distinguishable lines in the latter spectrum would be thrown together in the Nova spectrum, and appear as broad bands. A good instance of this appears in Campbell's list. He records a band extending from $\lambda\lambda$ 4534 to 4501. In the spectrum of α Cygni there is a strong line at each of the positions given, and between them there occurs a strong quartet of lines. The former are well enhanced lines of titanium, and the latter of iron. It seems extremely likely, therefore, that the six lines thrown together produce the apparently continuous band observed by Campbell.

If the stage of α Cygni has really been reached, the following considerations come in:—

[1] *Ast.-Phys. Jour.*, vol. xi. p. 807, 1892.
[2] *Ast.-Phys. Jour.*, vol. xii. p. 912, 1893.

In the orderly condensation of swarms, according to the meteoritic hypothesis, the earlier stages are—

Ascending temperature. ↑

Cygnian	Dark lines, corresponding chiefly with the enhanced lines of various metals.
Polarian	Dark lines, comprising both arc and enhanced lines of various metals.
Aldebarian	Dark lines, chiefly corresponding to those which appear in the arc spectra of various metals.
Antarian	Mixed bright and dark flutings and dark lines. Bright hydrogen lines in those stars which are variable.
Nebula	Bright lines.

In the case of new stars, after the maximum of luminosity has been reached, however high they ascend, short of the apex of the temperature curve, this order must be reversed, and hence we should expect to find the spectrum varying in accordance with the foregoing sequence, but in the reverse order.

In Nova Coronæ (1866), according to the observations of Sir William Huggins and Dr. Miller, the absorption spectrum was very similar to that of α Orionis, which is a star of the Antarian group, so that the temperature attained was relatively low; this, indeed, is demonstrated by the fact that at present it shines faintly as an Antarian star, and doubtless did so before the collision. The collision, therefore, probably did not take Nova Coronæ very much above its initial stage of temperature, and when the disturbance was over it simply reverted to its old conditions.

The spectrum of Nova Cygni (1876) was not photographed, and as special attention was given by most observers to the bright lines, there is no satisfactory record of the absorption spectrum.

This now appears as a nebula, and doubtless it was a nebula to begin with, as Nova Coronæ was a star to begin with.

In Nova Aurigæ (1892), as we have seen, the comparison with α Cygni indicates that the Cygnian (that is, a higher) stage was reached, and in the final stages its spectrum corresponded with that of the planetary nebulæ, that is, a stage lower than that reached by Nova Coronæ. The intermediate stages, however, were not observed, possibly because the star was never very brilliant, and partly because of the difficulty of observing closely grouped lines, such as occur in the Polarian and Aldebarian stages when they are rendered broad by such disturbances as those which were obviously present in the Nova.

The observed maximum magnitude in the case of a new star will evidently depend upon the distance and size of the colliding masses, as well as upon the temperature produced by the collision. It is not remarkable, therefore, that there is no apparent relation between the greatest brightness and the temperature indicated by the spectra. Nova Coronæ, with its relatively low temperature, shone for a time as a second magnitude star, while Nova Aurigæ, with a much higher temperature, scarcely surpassed a star of the fifth magnitude.

I now return to Nova Persei.

If the idea that in the present Nova the swarm which gives the dark line spectrum resembles α Cygni be confirmed, as its temperature is reduced we may expect it to pass successively through some or all of the stages of temperature represented by stars of the Polarian, Aldebarian and Antarian groups, enhanced lines being first replaced by arc lines and then by flutings. Whether it remains at one of these stages or undergoes a further backwardation into a nebula will be a point of the highest interest.

If, like Nova Aurigæ, the present Nova should end as a nebula, it will furnish a most convincing proof of the fundamental metallic nature of nebulæ.

In conclusion, I wish to express my thanks to Dr. W. J. S. Lockyer and Mr. F. E. Baxandall, of the Solar Physics Observatory, and to Mr. A. Fowler, of the Royal College of Science, who have greatly assisted me in preparing the present note, and who, with the addition of Mr. Butler, of the Solar Physics Observatory, secured the excellent set of photographs and eye observations on the night of the 25th, from which the new knowledge has been derived.

The preparation of the slides I owe to Mr. J. P. Wilkie.

Solar Physics Observatory, February 28.

RECENT SWISS GEOLOGY.

THE glaciers of the Alps have lost considerably in bulk during the last forty years. This began at rather different dates, for some were still advancing in 1860, while by 1870 the diminution was very marked. Since then there have been slight oscillations, but until lately loss, on the whole, has exceeded gain; now, perhaps, the tide has turned. The report on the Unter Grindelwald glacier, by Prof. A. Baltzer,[1] describes the changes this glacier has undergone during the above-named period, and the results of some special observations made between 1892 and 1897. It was unusually well suited for the purpose, for its changes had been very conspicuous, and they had been already more closely observed than in many other glaciers.

In 1858, as is shown in a photograph, the glacier descended to the level of the valley beneath Grindelwald, where the Weisse Lütschine, in the summer of that year, issued from an ice cave. By 1870 the glacier had retreated up the glen between the Eiger and the Mettenberg, exposing three great rocky steps, the existence of which, it may be remarked, is anything but a favourable testimony to the excavatory power of ice; and its thickness higher up had so much diminished that the writer looked down a cliff, fully sixty feet high, on to the surface very nearly at the place where he remembered stepping easily from the ice to the rock on his way from the Strahleck Pass. A photograph representing the state of the glacier in 1895, on which Prof. Baltzer has indicated its former extent, shows how great the change has been; the modern ice stream looking, by comparison, like a caterpillar crawling to hide its diminished head in a rocky gorge (Fig. 1). One remarkable effect of this shrinkage (as described by Mr. F. F. Tuckett in the *Alpine Journal*, vol. vi. p. 30), was to lay bare, in 1871, a quarry in a bed of mottled pale red and green marble, which had once been extensively worked, but for about a century had been completely hidden beneath the ice. By the retreat of the glacier large areas of ice-worn rock have been exposed, several of which are represented by photographs in Prof. Baltzer's memoir. From study of these he concludes that there are two forms of ice-erosion; one—the ordinary—smoothing or abrading of the rock surfaces; the other, a tearing and a splitting off of fragments in cases where the rock is much traversed by divisional planes. As he deems this to have been less generally recognised, he illustrates it by photographs. It is difficult without actual examination of the localities to form an opinion on this point. That the rock, chiefly from mechanical causes, is readily broken is beyond question; but, though the fragments thus formed would be more easily removed than from a solid mass, it is doubtful whether the ice plays more than a secondary part, so that the remark would be equally true of any other kind of erosion. Given an irregular surface, the friction of a body moving over it would tell upon the prominences; but probably more pieces fall away than are broken away.

[1] Vol. xxxiii., part 2, of the *Neue Denkschriften der Allgemeinen Schweizerischen Gesellschaft.*